

## THAT WHICH IS CLAIMED IS:

1. A loop/slurry polymerization process comprising contacting in a reaction zone, at a temperature within a range of about 150°F to about 180°F in the presence of a hydrocarbon diluent having three or four carbon molecules per molecule, and in the absence of hydrogen:

a) ethylene monomer;

b) a higher alpha-olefin comonomer selected from the group consisting of 1-butene, 1-hexene and mixtures thereof;

c) a catalyst system comprising a magnesium compound and a titanium halide, wherein both the magnesium compound and the titanium halide are supported on an inorganic oxide support and said catalyst system has a particle size within a range of about 1 to about 40 microns; and

d) an aluminum alkyl cocatalyst;

and recovering a copolymer of ethylene.

2. A process according to claim 1 wherein said reaction zone temperature is within a range of about 160°F to about 170°F.

3. A process according to claim 1 wherein said inorganic oxide support is selected from the group consisting of silica, silica-alumina, alumina, fluorided alumina, sited alumina, thoria, aluminophosphate, aluminum phosphate, phosphated silica, phosphated alumina, silica-titania, coprecipitated silica/titania, fluorided/sited alumina, and mixtures thereof.

claims  
1-19  
cancelled per A

4. A process according to claim 3 wherein said inorganic oxide is a silica-containing support selected from the group consisting of silica, silica-alumina, phosphated silica, silica-titania, coprecipitated silica/titania, fluorided/silated alumina, and mixtures thereof.
5. A process according to claim 4 wherein said support is essentially silica.
6. A process according to claim 1 wherein said catalyst system particle size is within a range of about 2 to about 20 microns.
7. A process according to claim 6 wherein said catalyst system particle size is within a range of about 4 to about 16 microns.
8. A process according to claim 1 wherein said aluminum alkyl cocatalyst has the general formulae  $AlR_3$ ,  $AlR_2X$ , and/or  $AlRX_2$ , wherein R is an alkyl group having from about 1 to about 12 carbon atoms per molecule and X is a halogen atom.
9. A process according to claim 9 wherein said aluminum alkyl cocatalyst is selected from the group consisting of triethyl aluminum, triisobutylaluminum chloride, diethyl aluminum chloride, ethylaluminum sesquichloride, and mixtures thereof.
10. A process according to claim 9 wherein said aluminum alkyl cocatalyst is selected from the group consisting of triethyl aluminum, triisobutyl aluminum and mixtures thereof.

11 . A process according to claim 1 wherein said aluminum alkyl cocatalyst is present in the reactor in an amount within a range of about 5 to about 500 mg/kg, based on the mass of reactor diluent.

12. A process according to claim 1 wherein said catalyst system and aluminum alkyl cocatalyst are contacted prior to contacting said ethylene.

13. A process according to claim 1 wherein said diluent is isobutane.

14. A process according to claim 1 wherein said copolymer of ethylene comprises a polymer having:

a) a weight average molecular weight greater than about one million;

b) an inherent viscosity greater than about 19;

c) a particle size less than about 400 microns;

c) a density within a range of about 0.92 g/cc to about 0.94 g/cc;

d) a high load melt index within a range of 0 g/10 minutes;

e) about 0.05 to about 3 weight percent comonomer; and

e) a sand wheel abrasion loss of less than about 150 grams.

15. A copolymer of ethylene according to claim 14 having a weight average molecular weight greater than about two million.

16. A copolymer of ethylene according to claim 14 having an inherent viscosity within a range of about 20 to about 28.

17. A copolymer of ethylene according to claim 14 having a particle size within a range of about 400 microns to about 40 microns.

18. A loop/slurry polymerization process comprising contacting in a reaction zone, at a temperature within a range of about 150°F to about 180°F in the presence of a hydrocarbon diluent having three or four carbon molecules per molecule, and in the absence of hydrogen:

5           a) ethylene monomer;

          b) a catalyst system comprising an organometallic compound selected from the group consisting of zirconium complexed with a beta-stable ligand and hafnium complexed with a beta-stable ligand, wherein the organometallic compound is supported on an inorganic oxide support comprising alumina and said catalyst system has a particle size within a range of about 1 to about 40 microns; and

          c) an aluminum alkyl cocatalyst;

and recovering a homopolymer of ethylene.

10           19. A loop/slurry polymerization process comprising contacting in a reaction zone, at a temperature within a range of about 150°F to about 180°F in the presence of a hydrocarbon diluent having three or four carbon molecules per molecule, and in the absence of hydrogen:

- 5                   a) ethylene monomer;
- b) a higher alpha-olefin comonomer having from about three to  
about ten carbon atoms per molecule;
- c) a catalyst system comprising an organometallic compound  
selected from the group consisting of zirconium complexed with a beta-stable  
10           ligand and hafnium complexed with a beta-stable ligand, wherein the  
organometallic compound is supported on an inorganic oxide support  
comprising alumina and said catalyst system has a particle size within a range  
of about 1 to about 40 microns; and
- c) an aluminum alkyl cocatalyst;
- 15                   and recovering a copolymer of ethylene.

*Claims 20-29 added per A*